Citation:

Tolstrup JS, Halkjaer J, Heitmann BL, Tjonneland AM, Overvad K, Sorensen TI, Gronbaek MN. Alcohol drinking frequency in relation to subsequent changes in waist circumference. *Am J Clin Nutr*. 2008; 957-63.

PubMed ID: 18400719

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To test the hypothesis that drinking frequency is associated with subsequent changes in waist circumference and development of abdominal obesity.

Inclusion Criteria:

- Eligible subjects were born in Denmark and had no previous cancers at the time of inclusion

Exclusion Criteria:

- 547 persons were excluded from the cohort due to having a cancer diagnosis before recruitment which had not yet been registered in the Danish Cancer Registry at the time of the invitation
- Implausible or missing data, incomplete information

Description of Study Protocol:

Recruitment

From December 1993 to May 1997, 160,725 Danish men and women aged 50 - 64 years were invited by mail to participate in the population-based Diet, Cancer and Health study.

Design: Prospective Cohort Study

Blinding used (if applicable): not applicable

Intervention (if applicable): not applicable

Statistical Analysis

- Associations between alcohol variables and average 5-year waist change were estimated in multiple linear regression analyses
- Multiple polytomous logistic regression was applied to estimate odds ratios of major waist loss and major waist gain
- For linear variables, the linearity assumption was evaluated by linear splines with knots placed at sex-specific quintiles of the distribution
- No systematic departure from linearity was found except for the total energy intake, thus total energy intake was modeled with linear splines set at the quintiles
- A validation study was performed on some participants to compare measures of waist circumference obtained by self-report and the two measures were found to be highly correlated.

Data Collection Summary:

Timing of Measurements

Data on alcohol drinking frequency and waist circumference were collected at baseline (1993-1997). Follow-up data on waist circumference collected in 1999 - 2002.

Dependent Variables

- Waist circumference: measured by technicians at baseline, at the smallest horizontal circumference between ribs and iliac crest
- At Follow-up, measured at home, at the level of the umbilicus, by the participants themselves with a measuring tape that was provided, and reported in the questionnaires

Independent Variables

- Questions about usual amount of alcohol intake were included on a 192-item food frequency questionnaire that was enclosed with the invitation to participate (specific amounts of each beverage type: light, normal and fortified beer, red, white and fortified wine, and spirits)
- Questionnaire was scanned and interviewer checked during a clinic visit, when another questionnaire about lifestyle factors, including information on alcohol drinking frequency, was completed (never drink, <1 time/month, 1 -3 times/month, 1 time/week, 2 - 4 times/week, 5 - 6 times/week, or daily)
- Follow-up survey included self-administered questionnaires about diet, lifestyle and anthropometry

Control Variables

- Age
- Baseline waist circumference
- Total energy intake calculated from diet questionnaire
- Smoking status
- Preferred beverage type
- Physical activity
- Education

Description of Actual Data Sample:

Initial N: 160,725 men and women invited to participate. 57,053 agreed to participate (35%

response). 547 were excluded due to having cancer. Between baseline and follow-up, 1,692 participants had died and 435 had emigrated. 632 persons returned questionnaires with too many errors, leaving 44,904 persons in the follow-up study sample.

Attrition (final N): 43,543 men and women remained for analysis, due to:

- Participants with missing baseline or follow-up values on waist circumference (n = 664)
- Implausibly large or small waist circumferences (n = 110)
- Participants with incomplete information on alcohol variables (n = 74) or reporting impossible or unlikely combinations of frequency and average amount (n = 127)
- Subjects with incomplete information on any of the confounders (n = 386)

Age: aged 50 -65 years

Ethnicity: not described

Other relevant demographics:

Anthropometrics

Location: Denmark

Summary of Results:

Key Findings:

- Median time between baseline and follow-up was 5.3 years (range 3.0 -8.7 years).
- During that time, the average 5-year change in waist circumference was 6.7 cm for women and 2.5 cm for men.
- The median amount of alcohol intake was 5.5 drinks per week for women and 11 drinks per week for men (one drink = 12 g pure alcohol).
- Drinking frequency was inversely associated with changes in waist circumference in women (P for linear trend < 0.0001) and was unassociated with changes in waist circumference in men (P for linear trend = 0.15).
- Drinking frequency was unassociated with major waist loss but was inversely associated with major waist gain: odds ratios among men were 0.97 (95% confidence interval: 0.73 to 1.28) for never drinking, 0.95 (95% confidence interval: 0.81 to 1.12) for drinking on 1 day of the week, 0.88 (95% confidence interval: 0.77 to 0.99) for drinking on 2 - 4 days of the week, 0.82 (95% confidence interval: 0.71 to -0.95) for drinking on 5 - 6 days of the week, and 0.79 (95% confidence interval: 0.69 to 0.9) for drinking 7 days of the week, compared with men who drank alcohol <1 day per week (P for trend < 0.0001). Results for women were similar (P for trend < 0.0001).
- For major waist gain, the odds for major waist gain were highest in the light or nondrinkers, dropping to a minimum in participants drinking 14-20 drinks for women (OR: 0.81; 95% CI: 0.72, 0.92) and 21-28 drinks for men (OR: 0.83; 95% CI: 0.73, 0.93), then rising a little in the heaviest drinkers (>28 drinks/week). However, the odds for major waist gain in this category was not significantly diffent from drinking <1 drink/week.
- Adjustment for the amount of alcohol intake or total energy intake did not affect results considerably.
- Within strata of beer preference, wine preference, and no preference, inverse associations between drinking frequency and major waist gain were consistently observed among both men and women in accordance with the main analysis.

Author Conclusion:

In conclusion, results from this prospective study do not imply that regular alcohol intake is involved in development of abdominal obesity. Rather, we observed that drinking frequency was inversely associated with waist gain, suggesting that the most frequent drinkers had the lowest odds for a positive change in waist circumference during the follow-up period of ~5 years. This finding was independent of smoking status, absolute value of waist circumference at baseline, preferred beverage type, and amount of alcohol intake.

Reviewer Comments:

Large population-based study. Most data based on self-report. Alcohol drinking frequency only

measured at baseline. Waist circumference measured in 2 different areas at baseline by technicians and at follow-up by participants themselves, although authors note that the measurements were highly correlated. Authors note the following additional limitations:

- *Lack of ability to identify participants with a binge-like drinking pattern*
- *35% participation rate*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A
Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes

3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	No
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A

6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	???
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	No
7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	???
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	N/A
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	N/A

	8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
	8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
	8.6.	Was clinical significance as well as statistical significance reported?	Yes
	8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**		Yes
	9.1.	Is there a discussion of findings?	Yes
	9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**		Yes
	10.1.	Were sources of funding and investigators' affiliations described?	Yes
	10.2.	Was the study free from apparent conflict of interest?	Yes